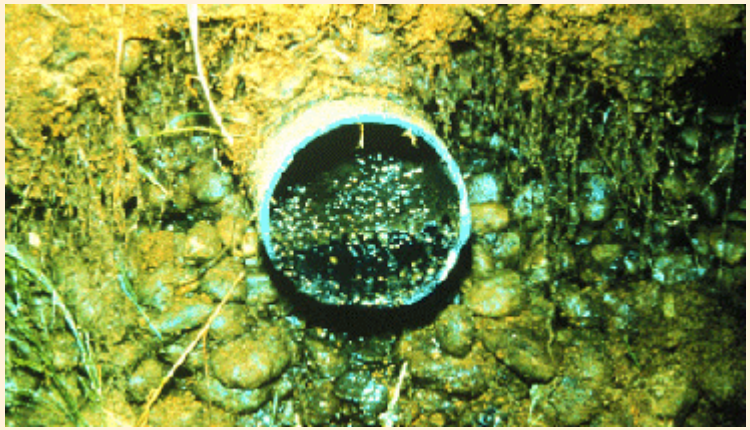
Warwick and James Rivers, Skiffes Creek, Baptist Run, and Deep Creek TMDL Development

Final Public Meeting

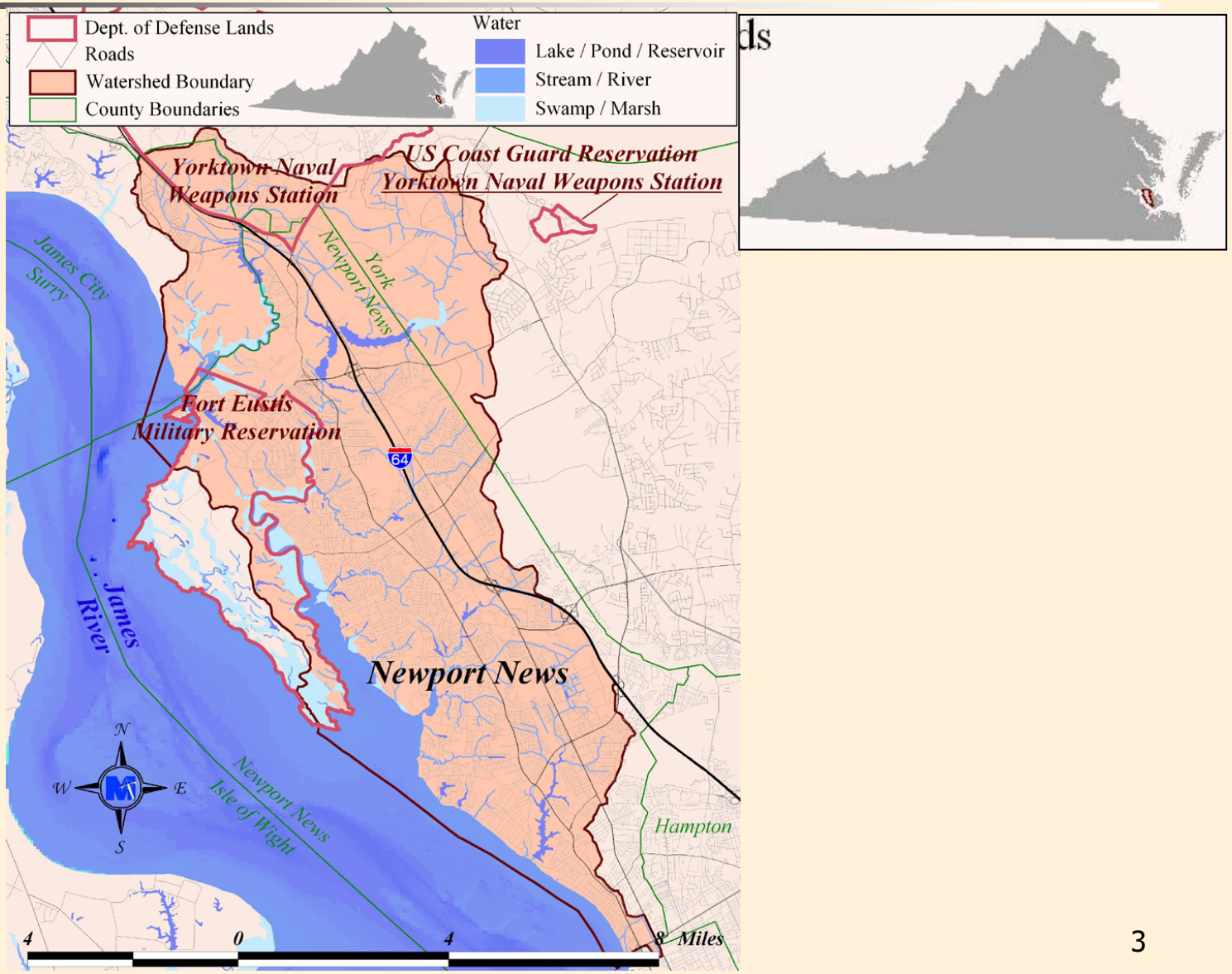
May 9, 2007

Why Are We Here?

- To discuss the bacteria TMDL development for Warwick and James River, Skiffes Creek, Baptist Run, and Deep Creek
  - Total Maximum Daily Load
  - It is how much pollutant can enter the stream and have the stream meet the water quality standards



Where is the Watershed?



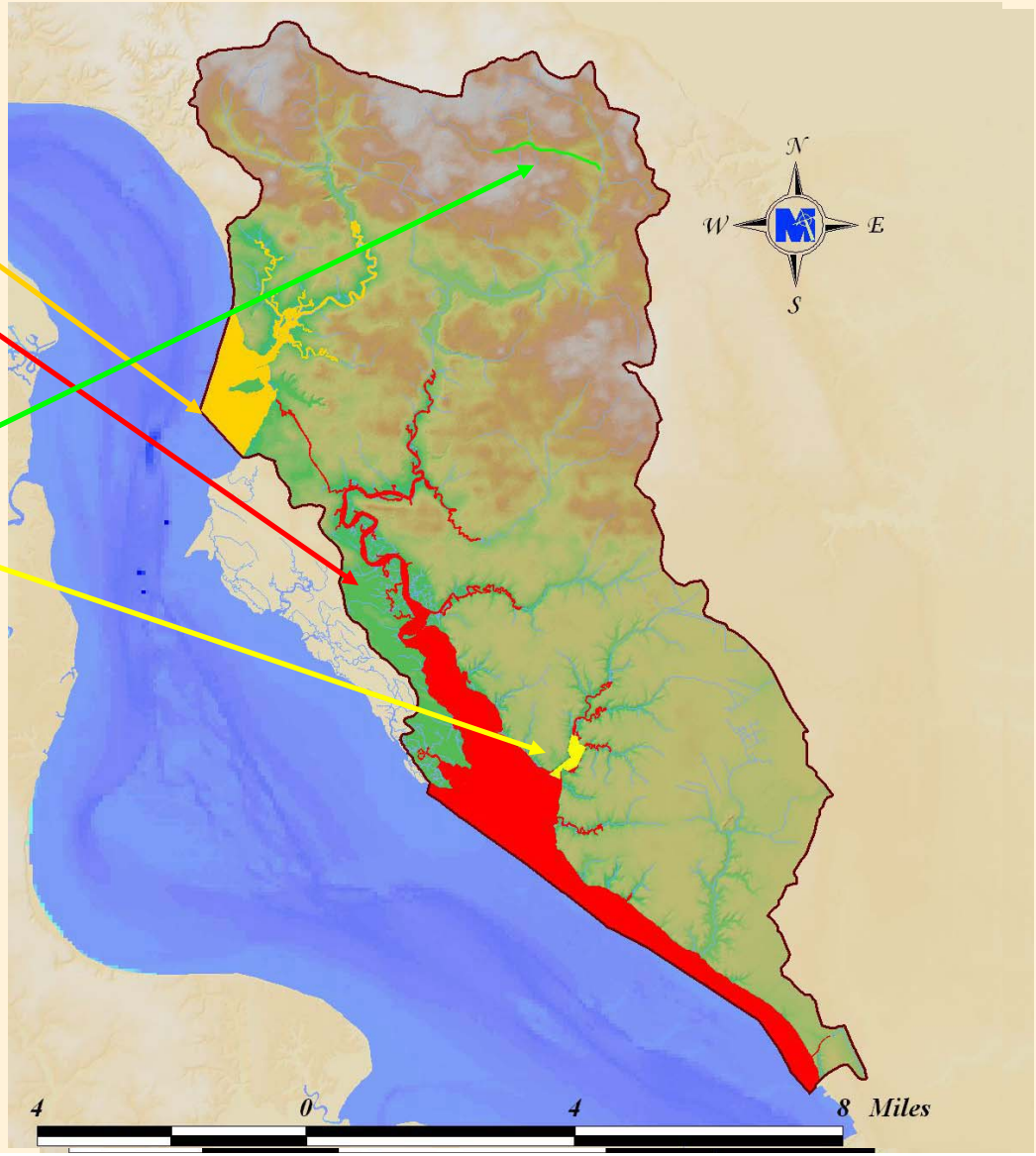
Where are the Impairments?

Impairment Name	Listed by	Reason Listed	Extent Description	Extent River Miles	Color in Figure
Baptist Run	DEQ	Excess fecal bacteria for swimming	Outflow of pond near Crawford Dr. to the confluence with Great Run and Beaverdam Creek	0.0 to 1.7	Green
Deep Creek	DEQ	Excess fecal bacteria for swimming	Warwick Yacht Club to the outlet of Deep Creek	0.76 to 0.0	Yellow
James River – opposite Fort Eustis & Skiffes Creek	VDH	Excess fecal bacteria for harvesting shellfish	Condemnation Zone #059-023	4.08 to 0.0	Mustard
Warwick and James Rivers	VDH	Excess fecal bacteria for harvesting shellfish	Condemnation Zone #34	14.7 to 0.0	Red

Where are the Impairments?

VDH – Shellfish Harvesting Use

DEQ – Swimming Use



Water Quality Standards = Goals

- **DEQ Swimming/Recreation Use**
  - *E. coli* Bacteria Standards (for Riverine)
    - 126 cfu/100mL calendar month geometric mean
    - 235 cfu/100mL instantaneous sample

Baptist Run

Deep Creek

  - *Enterococci* Bacteria Standards (for Estuarine)
    - 35 cfu/100mL calendar month geometric mean
    - 104 cfu/100mL instantaneous sample

- **VDH Shellfish Harvesting Use**
  - Fecal Coliform Standards
    - 14 MPN 30-month geometric mean
    - 49 MPN 30-month 90th percentile

Warwick River and Skiffes Creek

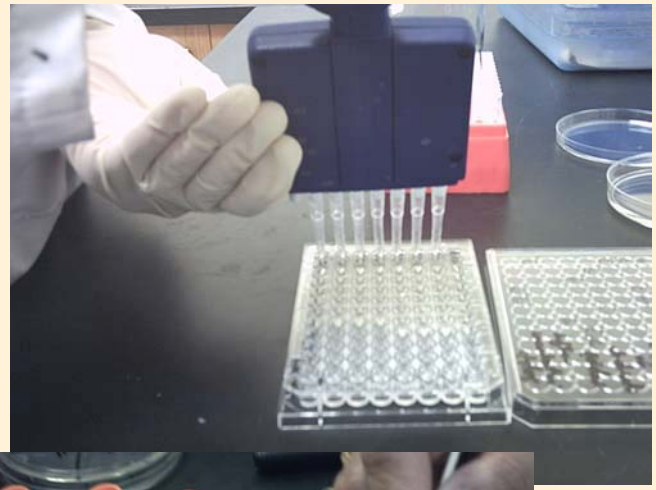
What are the Sources of Bacteria?

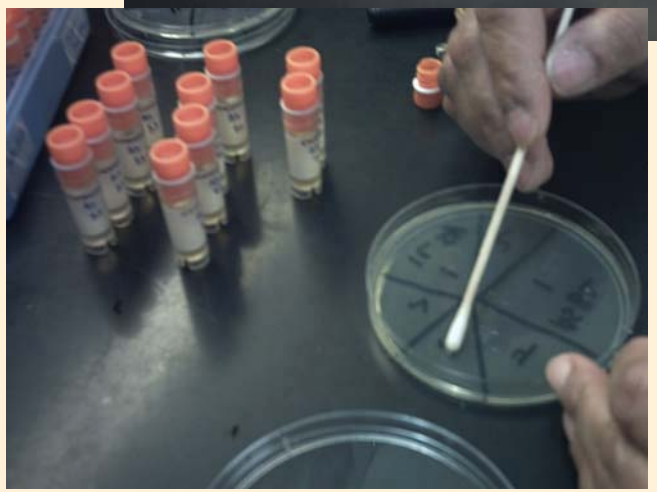
- Permitted Discharges
- Human
  - Failing Septics
  - Straight Pipes
  - Boats
- Pets
- Livestock
- Wildlife
- James River Tides

Bacterial Source Tracking (BST)

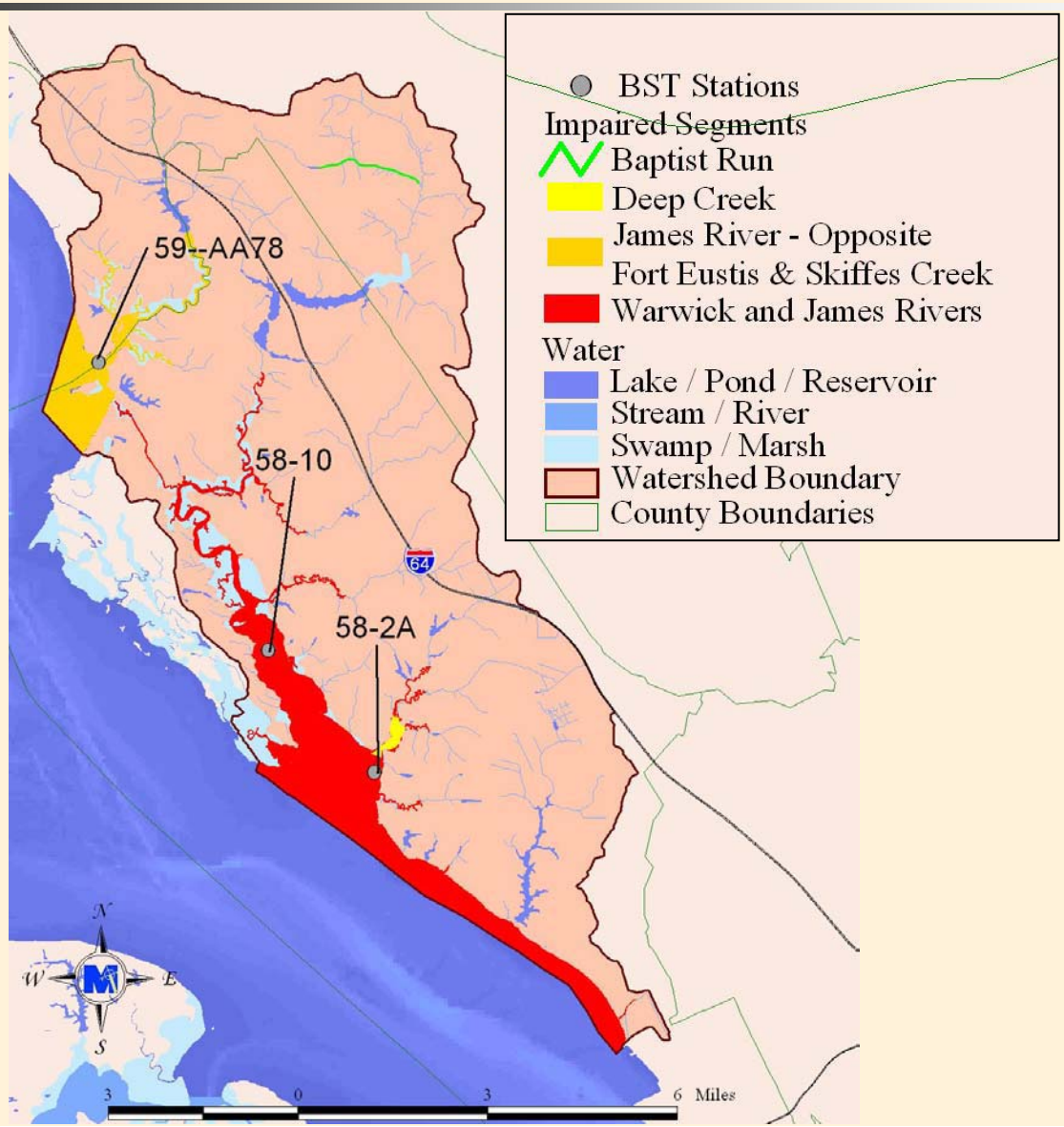
Independent Lab Test

- Determines bacteria source
  - human
  - pet
  - livestock
  - wildlife





BST Station Locations



BST Results:
What is the Predominant Source?

Impairment	Station ID	Weighted Averages:			
		Wildlife	Human	Livestock	Pet
Warwick River	58-10	18%	35%	23%	24%
Deep Creek	58-2A	19%	39%	14%	28%
Skiffes Creek	59-AA78	3%	21%	36%	40%

TMDL Development Steps

- Monitoring/Listing - Identify Water Quality Problem
  - Monitoring Ongoing
  - ✓ Listing Completed by DEQ and VDH
- Source Assessment – Locate Potential Sources of Pollutant in Watershed
  - ✓ Estimates Presented at first public meeting
- ✓ Modeling – Examine the Movement of Pollutant from Land to Water and Direct Inputs to Water
- Allocation/TMDL – Use a Computer Model to Determine the Load Reductions Necessary to Achieve Water Quality Goals

Modeling

DEQ – Swimming/Recreation Use:

Baptist Run – sub 1

Deep Creek – sub12

VDH – Shellfish Harvesting Use:

Warwick River – subs 4,5,6,7,9,12

Skiffes Creek – sub 16

How Do We Determine the Bacteria TMDLs?

+

Watershed data

TMDL

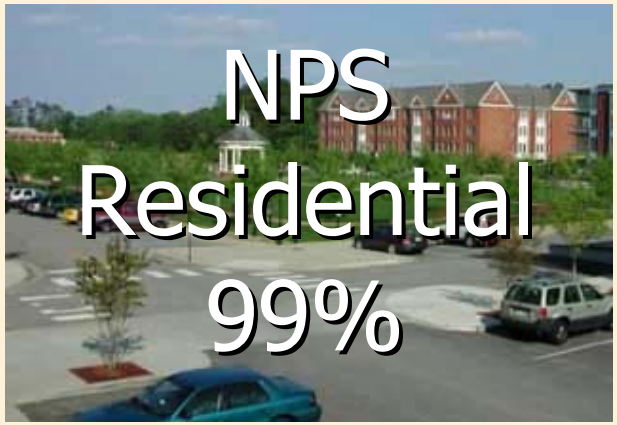
Baptist Run: *Swimming/Recreation Use* *E. coli* % Reduction Scenarios

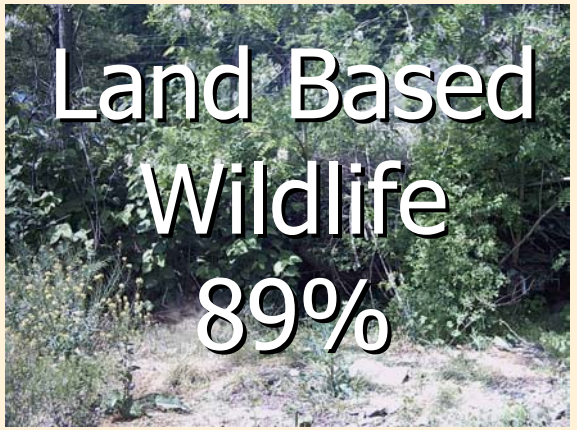
Scenario	Reductions	% >126 Geometric Mean	% >235 Single Sample
1	None = Modeled Existing Conditions	13%	20%
2	90% Agricultural Land, 94% Residential Land, 100% correction of straight pipes	0%	10%
3	100% Anthropogenic (Human Influenced) Sources	0%	5%
4	91% Agricultural Land, 99% Residential Land, 100% correction of straight pipes, 89% Wildlife Land	0%	0%

Final Allocation Scenario 4
Stage I Management Scenario 2

Agricultural Land = Cropland, Pasture, Hay, Livestock Access to streams
Residential Land = Low density residential
Wildlife Land = Barren, Commercial, Forest, High density residential, Wetlands

What Reductions are required for Baptist Run?





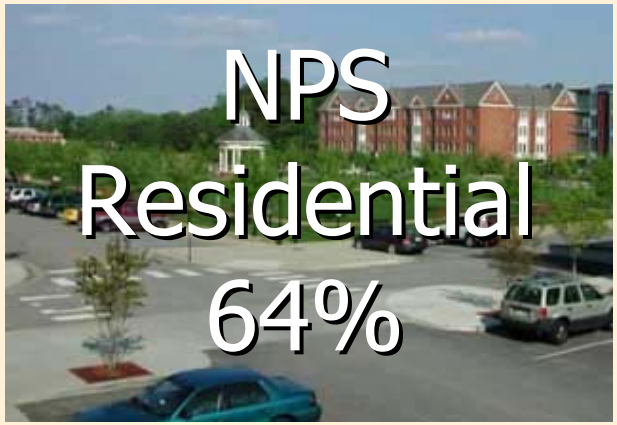
Deep Creek: *Swimming/Recreation Use* *Enterococci* % Reduction Scenarios

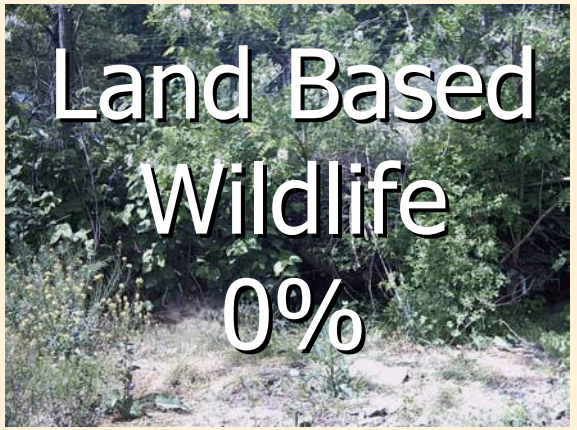
Scenario	Reductions	% >35 Geometric Mean	% >104 Single Sample
1	None = Modeled Existing Conditions	0%	1.40%
2	100% correction of straight pipes	0%	0.91%
3	29% Agricultural Land, 64% Residential Land, 100% correction of straight pipes	0%	0%

Final Allocation Scenario 3
Stage I Management Scenario 2

Agricultural Land = Cropland, Pasture, Hay, Livestock Access to streams
Residential Land = Low density residential

What Reductions are required for Deep Creek?





Warwick River: *Shellfish Harvesting Use* Fecal Coliform % Reduction Scenarios

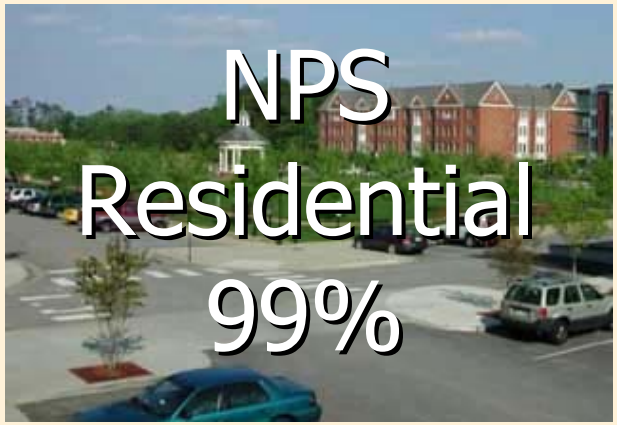
Scenario	Reductions	% >14 Geometric Mean	% >49 90th Percentile
1	None = Modeled Existing Conditions	100%	100%
2	100% correction of straight pipes	100%	100%
3	100% Anthropogenic (Human Influenced) Sources	100%	0%
4	100% correction of straight pipes, 86% Direct Livestock, 91% Agricultural Land, 99% Residential Land, 36% Wildlife Land, 37% Wildlife Direct	0%	0%

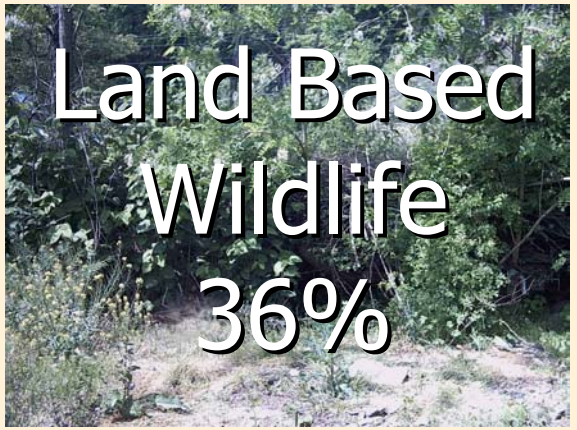
Final Allocation Scenario 4
Stage I Management Scenario 4 without reductions to Wildlife loads

Agricultural Land = Cropland, Pasture, Hay, Livestock Access to streams
Residential Land = Low density residential
Wildlife Land = Barren, Commercial, Forest, High density residential, Wetlands

**Deep Creek is included in this impairment and needs to meet these reductions as they are more strict than the reductions required to meet the Enterococci standards.*

What Reductions are required for Warwick River?





Warwick River: *Shellfish Harvesting Use*
Permanent Condemnation Area #34B

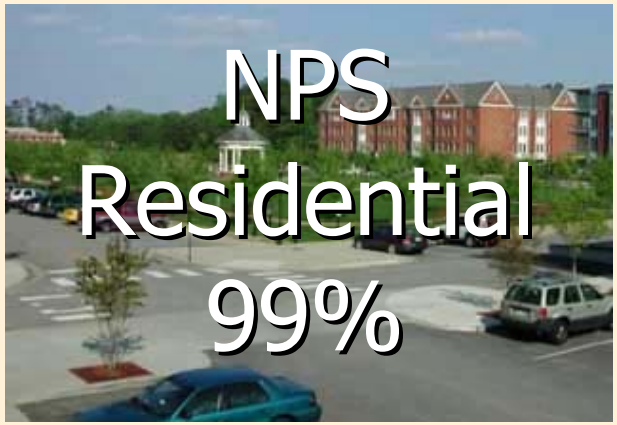
Skiffes Creek: *Shellfish Harvesting Use* Fecal Coliform % Reduction Scenarios

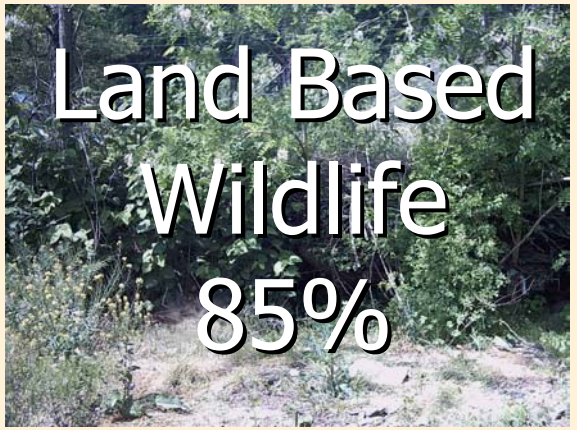
Scenario	Reductions	% >14 Geometric Mean	% >49 90th Percentile
1	None = Modeled Existing Conditions	100%	0%
2	100% correction of straight pipes	100%	0%
3	100% Anthropogenic (Human Influenced) Sources	100%	0%
4	100% correction of straight pipes, 93% Direct Livestock, 96% Agricultural Land, 99% Residential Land, 85% Wildlife Land, 91% Wildlife Direct	0%	0%

Final Allocation Scenario 4
Stage I Management Scenario 4 without reductions to Wildlife loads

Agricultural Land = Cropland, Pasture, Hay, Livestock Access to streams
Residential Land = Low density residential
Wildlife Land = Barren, Commercial, Forest, High density residential, Wetlands

What Reductions are required for Skiffes Creek?





Municipal Separate Storm Sewer System (MS4)

- MS4 bacteria loads were estimated as sum of loads from impervious area within impairment drainage area
  - Residential, commercial/industrial/transportation land uses
- City of Newport News (VA0088641)
  - Deep Creek total drainage area = 4,736 acres
    - 410 acres impervious
  - Warwick River total drainage area = 38,211 acres
    - 1,969 acres impervious
  - Skiffes Creek total drainage area = 8,540 acres
    - 89 acres impervious
- James City County (VAR040037)
  - Skiffes Creek total drainage area = 8,540 acres
    - 70 acres impervious

Municipal Separate Storm Sewer System (MS4)

- York County (VAR040028)
  - Baptist Run total drainage area = 1,503 acres
    - 13 acres impervious
  - Warwick River total drainage area = 38,211 acres
    - 39 acres impervious
  - Skiffes Creek total drainage area = 8,540 acres
    - 15 acres impervious
- Fort Eustis (VAR040035)
  - Skiffes Creek total drainage area = 8,540 acres
    - 22 acres impervious
  - Warwick River total drainage area = 38,211 acres
    - 156 acres impervious

Baptist Run *E. coli* TMDL

Impairment	WLA	LA	MOS	TMDL
Baptist Run	3.89E+09	6.42E+10	*Implicit*	6.81E+10
York County MS4 VAR040028	*3.21E+09*			
Future Load	*6.81E+08*			

MS4 = Municipal Separate Storm Sewer System
WLA = Waste Load Allocation = permitted bacteria sources
LA = Load Allocation = non-permitted bacteria sources
MOS = Margin of Safety
TMDL = Average Annual Total Maximum Daily Load

Deep Creek *Enterococci* TMDL

Impairment	WLA	LA	MOS	TMDL
Deep Creek	5.59E+12	2.67E+13	*Implicit*	3.23E+13
Newport News MS4 VA0088641	*5.27E+12*			
Future Load	*3.23E+11*			

MS4 = Municipal Separate Storm Sewer System
WLA = Waste Load Allocation = permitted bacteria sources
LA = Load Allocation = non-permitted bacteria sources
MOS = Margin of Safety
TMDL = Average Annual Total Maximum Daily Load

Warwick River Fecal Coliform TMDL

Impairment	WLA	LA	MOS	TMDL
Warwick River	1.16E+14	1.53E+14	*Implicit*	2.69E+14
VA0081272	*2.31E+13*			
Newport News MS4				
VA0088641	*3.19E+11*			
York County MS4				
VAR040028	*6.39E+09*			
Fort Eustis MS4				
VAR040035	*2.52E+10*			
Future Load	*9.24E+13*			

MS4 = Municipal Separate Storm Sewer System

WLA = Waste Load Allocation = permitted bacteria sources

LA = Load Allocation = non-permitted bacteria sources

MOS = Margin of Safety

TMDL = Average Annual Total Maximum Daily Load

Skiffes Creek Fecal Coliform TMDL

Impairment	WLA	LA	MOS	TMDL
Skiffes Creek	2.48E+12	2.36E+14		2.38E+14
Newport News MS4 VA0088641	*4.24E+10*			
Fort Eustis MS4 VAR040035	*1.05E+10*		*Implicit*	
James City Co MS4 VAR040037	*3.33E+10*			
Future Load	*2.38E+12*			

MS4 = Municipal Separate Storm Sewer System

WLA = Waste Load Allocation = permitted bacteria sources

LA = Load Allocation = non-permitted bacteria sources

MOS = Margin of Safety

TMDL = Average Annual Total Maximum Daily Load

Where Do We Go From Here?

- TMDL Public Review (30 days)
  - Send comments to Jennifer Howell by June 8th
- State Approval of TMDL document
- Submit TMDL to Environmental Protection Agency
- Submit TMDL to VA State Water Control Board
- Implementation Plan
- Implementation

What Can You Do To Help?

- Become Involved
  - Be a part of the Implementation Plan Development
- Pick up Pet Waste
  - At parks and in your own yard
  - Ask local governments to install doggy stations with bags and trash cans in parks and along trails
- Maintain Your Septic System
  - Pump-out every 3 to 5 years
  - Inspect your yard to make sure it's not leaking
- Educate
  - Let your friends and neighbors know there is a bacteria problem and what they can do to help

Warwick River TMDL Contacts

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Virginia Beach, VA 23462
(757) 518-2111
jshowell@deq.virginia.gov

Questions?

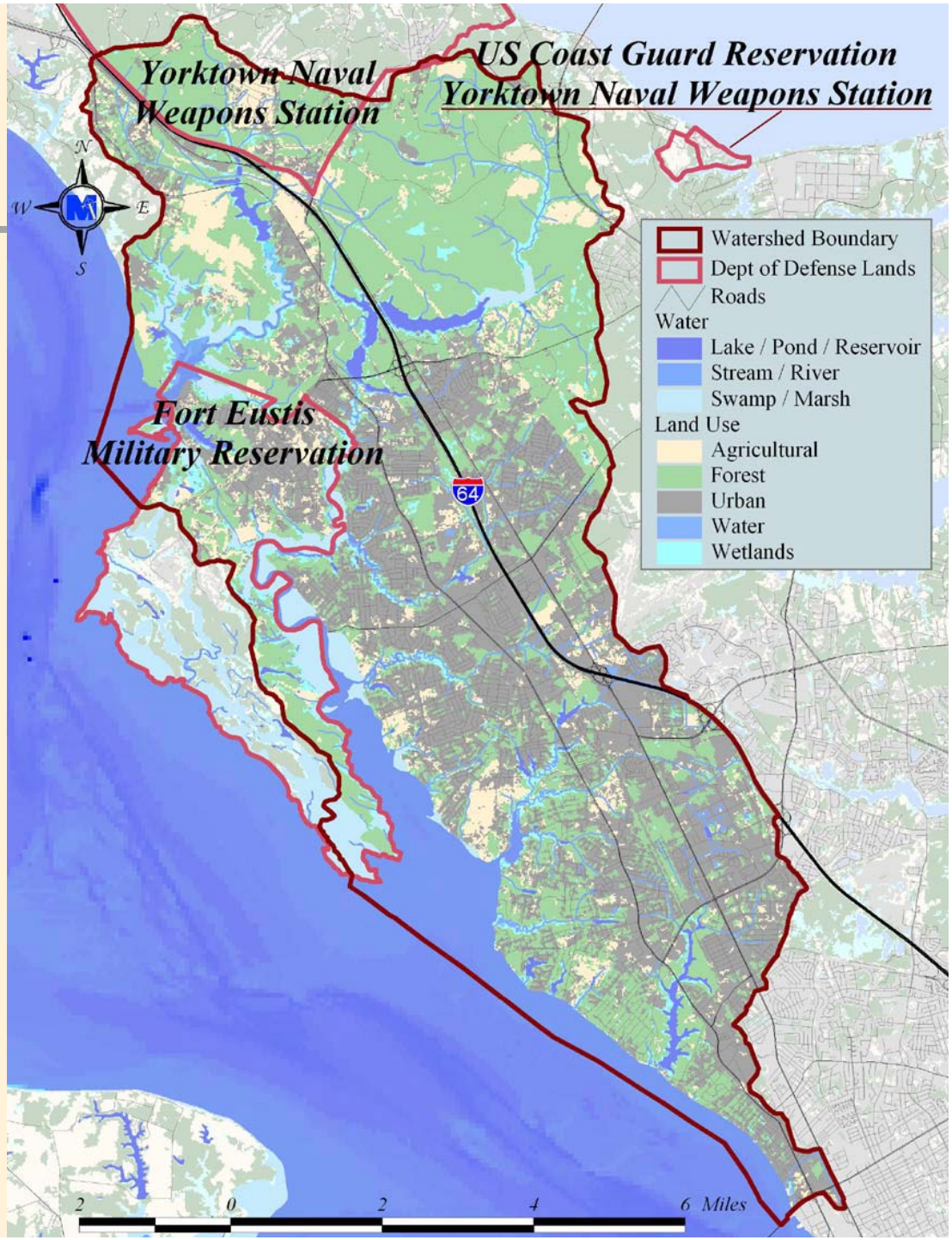
Thank You:

- Department of Environmental Quality
- Department of Conservation and Recreation
- Colonial Soil and Water Conservation District
- York County
- City of Newport News
- James City County
- Watershed stakeholders

www2.ci.newport-news.va.us/newport-news/exit.asp?url=http://www.kwreservoir.com/

Extra Information from 1st Public Meeting

Land Use


Yorktown Naval Weapons Station
US Coast Guard Reservation
Yorktown Naval Weapons Station
Fort Eustis Military Reservation
64
N
W
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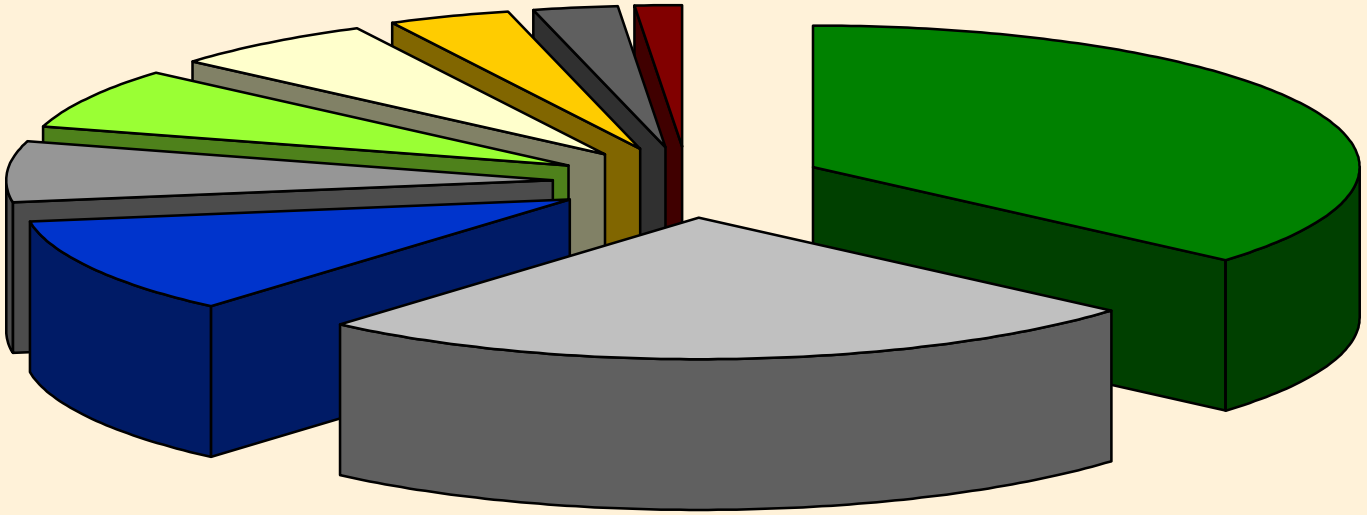
Watershed Boundary
Dept of Defense Lands
Roads
Water
Lake / Pond / Reservoir
Stream / River
Swamp / Marsh
Land Use
Agricultural
Forest
Urban
Water
Wetlands
2 0 2 4 6 Miles

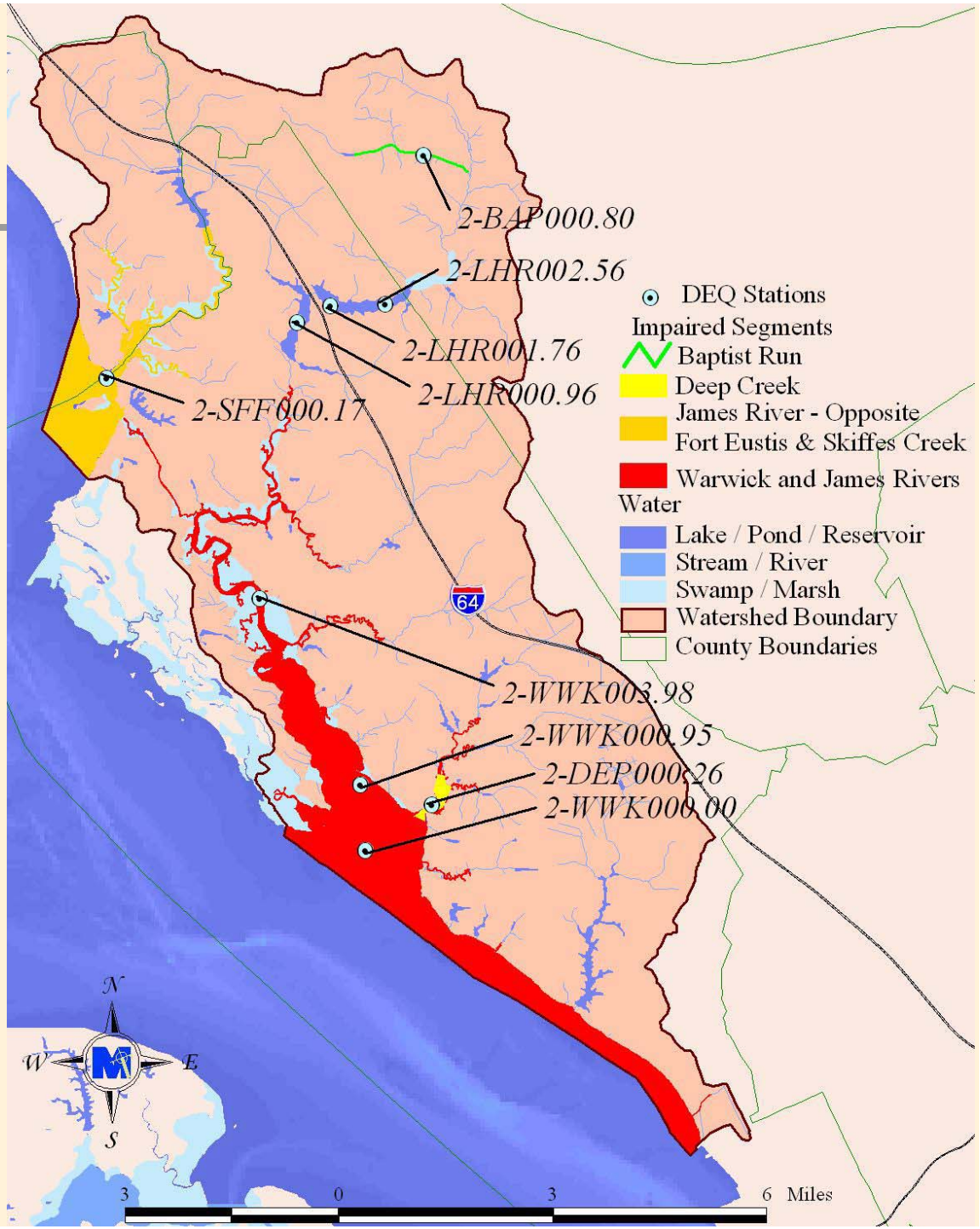
Land Use Percentage

Total watershed area is about 48,400 acres



Forest	36.4%
LID	25.1%
Water	11.0%
MID	7.0%
Wetland	6.9%
Pasture/Hay	6.0%
Row Crops	3.7%
HID	2.4%
Barren	1.4%

VADEQ Monitoring



VADEQ Fecal Coliform Data

January 1980 through November 2005

Stream	VADEQ Station	Count (#)	Minimum (cfu/100mL)	Maximum (cfu/100mL)	Mean (cfu/100mL)	Standard Deviation	# above 400 cfu/100mL	Violations[1] (%)
Deep Creek	2-DEP000.26	92	2	1,600	320	494	20	22
Skiffes Creek	2-SFF000.17	40	3	230	54	69	0	0
Warwick River	2-WWK000.00	44	2	100	22	33	0	0
Warwick River	2-WWK000.95	1	25	25	25	NA	0	0
Warwick River	2-WWK003.98	93	2	1,600	235	407	14	15
Baptist Run	2-BAP000.80	6	300	3,800	1,317	1,309	5	83
Lee Hall Reservoir	2-LHR000.96	7	25	100	36	28	0	0
Lee Hall Reservoir	2-LHR001.76	7	25	50	29	9	0	0
Lee Hall Reservoir	2-LHR002.56	10	25	3,400	390	1,059	1	10

[1]Violations are based on the current fecal coliform instantaneous standard (400 cfu/100mL)

VADEQ E. coli Data

July 2002 through March 2004

Stream	VADEQ Station	Count (#)	Minimum (cfu/100mL)	Maximum (cfu/100mL)	Mean (cfu/100mL)	Standard Deviation	# above 400 cfu/100mL	Violations[1] (%)
Deep Creek	2-DEP000.26	9	10	180	61	66	0	0
Warwick River	2-WWK000.95	1	10	10	10	NA	0	0
Warwick River	2-WWK003.98	9	10	120	37	37	0	0

[1] *Violations are based on the current E. coli instantaneous standard (235 cfu/100mL)*

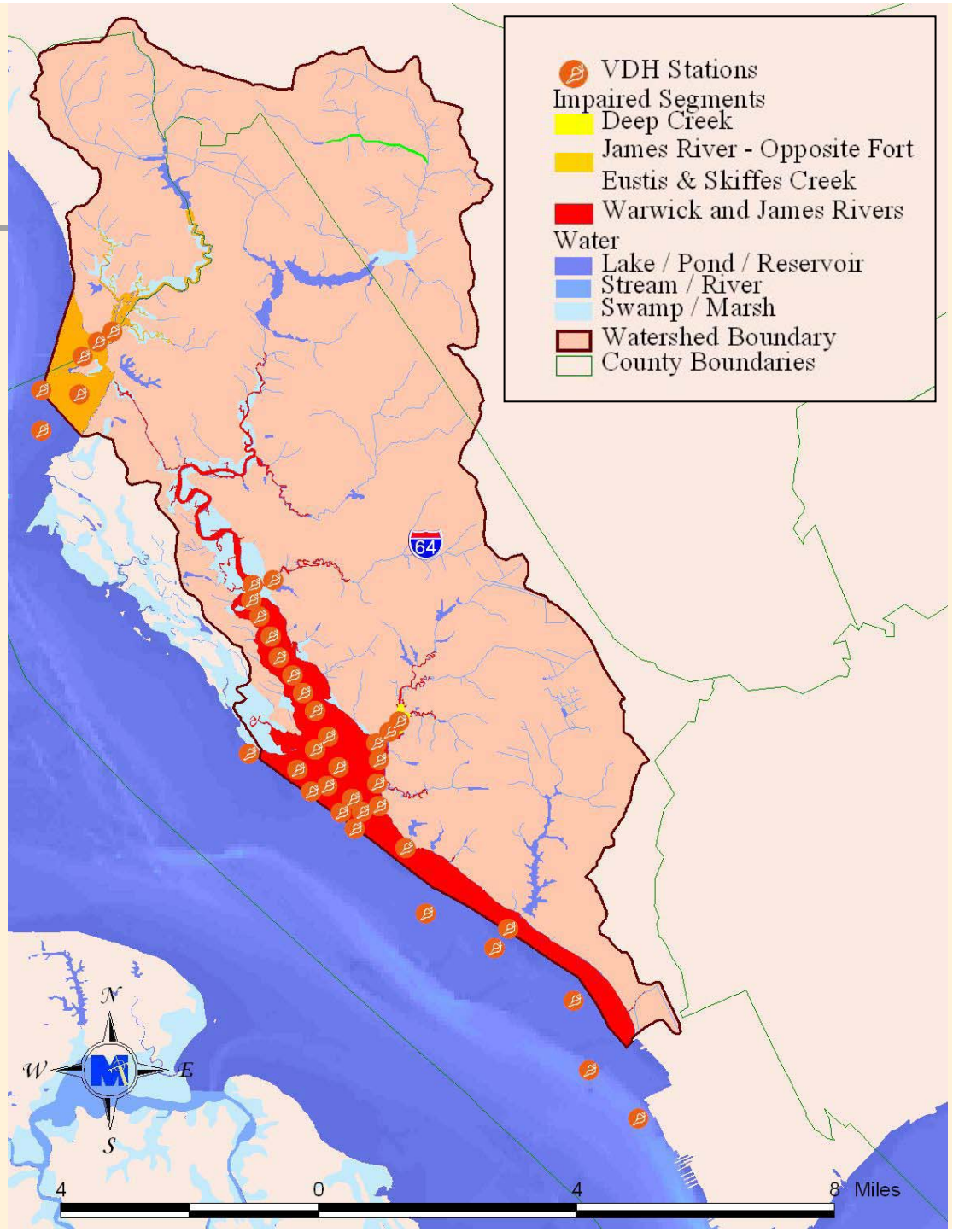
VADEQ *Enterococci* Data

March 2000 through December 2005

Stream	VADEQ Station	Count (#)	Minimum (cfu/100mL)	Maximum (cfu/100mL)	Mean (cfu/100mL)	Standard Deviation	# above 400 cfu/100mL	Violations[1] (%)
Warwick River	2-WWK003.98	22	10	1,000	114	231	4	18
Deep Creek	2-DEP000.26	22	10	420	84	108	4	18

[1] *Violations are based on the current enterococci 90th percentile standard (104 MPN)*

VDH Monitoring



VDH Fecal Coliform Data

Impairment	River	VDH Station	Count (#)	Mean (MPN)	Geomean[1] Violation (%)	90th Percentile[2] Violation (%)
Warwick and James Rivers	James River	57-E57	178	36.1	0	29
		58-A62	163	22.0	0	0
		58--A65	164	11.5	0	10
		58--B64	155	14.1	0	20
		58--B65	155	11.1	0	0
		58--C67	164	7.1	0	0
		58-1.5A	161	33.5	8	47
		58-10	164	44.2	45	78
		58-11	155	72.8	100	94
		58-12	155	84.1	100	100
		58-13	155	127.0	100	100
		58-13A	147	263.5	100	100
	Warwick River	58-1Z	163	11.9	0	0
		58-2A	160	49.4	30	52
		58-5	164	19.5	0	3
		58-6	164	23.4	0	8
		58-7	155	24.8	0	0
		58-8	164	41.8	17	25
		58-9	155	52.3	22	24
		58-JRSTP	164	27.7	15	24
	Warwick/ James conf.	58-0.5	164	14.6	0	0
		58-0.5Y	164	7.0	0	0
		58-0.5Z	155	12.2	0	0
		58-1A	153	27.9	20	36

[1] Violations are based on the current fecal coliform geometric mean standard (14 MPN)

[2] Violations are based on the current fecal coliform 90th percentile standard (49 MPN)

VDH Fecal Coliform Data (cont.)

Impairment	River	VDH Station	Count (#)	Mean (MPN)	Geomean[1] Violation (%)	90th Percentile[2] Violation (%)
James River – Opposite Fort Eustis | Skiffes Creek	James River	59--X79	69	32.33	0	0
	James River	59--X81	69	7.33	0	0
	James River	59--Z79	69	72.07	28	78
	Skiffes Creek	59--BB77	65	90.79	100	100
	Skiffes Creek/ James conf.	59--AA78	65	81.41	39	64
Warwick and James Rivers | Deep Creek	Deep Creek	58-3	164	122.82	78	99
	Deep Creek/ Warwick conf.	58-2.5	155	56.7	53	89
	Warwick River	58-4	194	187.04	100	100
None	James River	57-E61	182	8.09	0	0
	James River	57-F58	210	9.45	0	3
	James River	57-I54	182	18.19	0	1
	James River	57-M53	182	15.61	0	0
	James River	57-O50	182	10.73	0	0
	James River	58--E70	164	11.47	0	0
	James River	59--V81	210	11.66	0	0

[1]Violations are based on the current fecal coliform geometric mean standard (14 MPN)
[2]Violations are based on the current fecal coliform 90th percentile standard (49 MPN)

2006 Human Population Estimates

Impairment	Population	Housing Units				
		Number	With Sewer	With Septic	With Failing Septic	Other (Straight Pipe)
Baptist Run	518	230	97	132	28	1
Deep Creek	21,688	9,290	8,558	721	149	12
Warwick River	126,544	51,225	49,022	2,123	482	80
Skiffes Creek	6,674	2,481	2,307	166	36	8

2006 Pet Population Estimates

- Population/household based on literature values
  - 0.534 dogs per house
  - 0.598 cats per house
- Translated to HU based on U.S. Census
- Land-applied to low intensity residential

Impairment	Dogs	Cats
Baptist Run	123	138
Deep Creek	4,961	5,556
Warwick River	27,354	30,633
Skiffes Creek	1,325	1,484

2006 Livestock Population Estimates

Impairment	Beef	Beef Calves	Dairy Milker	Dairy Dry	Dairy Calves	Hog	Horse	Sheep
Baptist Run	0	0	0	0	0	0	1	0
Deep Creek	0	0	0	0	0	0	0	0
Warwick River	11	1	0	0	0	12	0	44
Skiffes Creek	6	1	6	2	2	17	0	6

Wildlife Population Estimates

- Population based on data provided by VDGIF biologists
- Distribution of waste based on habitat
  - Land-applied
  - Direct deposition to the stream
- Seasonal variations based on migration patterns and food sources

Beaver	Deer	Duck	Goose	Muskrat	Raccoon	Turkey
963	699	414	162	23,938	952	67